

NEW RESULTS ON CaH_2 THERMAL NEUTRON SCATTERING CROSS SECTIONS

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Calcium hydride (CaH_x) is a compound of interest in the frame of a current research programme on the transmutation of long-lived nuclear wastes. Indeed, since CaH_x is relatively stable in liquid sodium, it is one possible material that can be used for local moderation of the neutron spectrum in fast reactors such as PHENIX. In order to describe the moderated region from Monte Carlo and/or deterministic calculations, thermal neutron scattering data are needed. In particular, an adequate treatment of the thermal inelastic scattering cross sections for bound hydrogen is requested. The present work aims at the determination of these data.

The first step consisted in the measurement of the phonon frequency spectrum, which was carried out on the three axis spectrometer of the Institut Laue Langevin in Grenoble (France). This phonon frequency spectrum has already been published and so only a brief description of this measurement is given. Then, from physical grounds, the acoustic mode has been weighted relative to the optical modes in order to treat Hydrogen atoms bound in CaH_x . The $S(\alpha, \beta)$ scattering laws have been generated for various temperature using the NJOY code working in the incoherent approximation and the Gaussian approximation. The α and β grids used allow energy transfers of almost 2 eV at $T=296$ K. The deduced incoherent elastic and incoherent inelastic cross sections are presented, and the impact of the weighting factor, the grid definition and the order phonon expansion on these cross sections are discussed. In addition, the average displacement of proton in CaH_2 was calculated from our Debye-Waller integral and compared with previous values.

These new thermal neutron scattering data will be included in the JEFF3 European library.